

REMARKS

Claims 1-11 are pending in this application. By this Amendment, Claims 1-2 and 6-8 are amended. Applicants respectfully submit that no new matter is presented herein.

Specification

The Office Action objections to the Specification because the *Brief Description of the Drawings* section precedes the examples discussed in the *Detailed Description of the Invention* section. Applicants respectfully request clarification of the objection.

Applicants note the Office Action cites 37 C.F.R. §1.77(b) which provides the arrangement of the various sections in the Specification of a patent application. As noted on page 3 of the Office Action, the relevant section of the 37 C.F.R. §1.77(b) requires the *Brief Description of the Drawings* section precede the *Detailed Description of the Invention* section. As noted above, Applicants invention has arranged the Specification exactly as required by 37 C.F.R. §1.77(b), that is, the description of the drawings precedes the detailed description of the invention. Therefore, Applicants respectfully request any subsequent Office Action clarify the basis for the objection since the Applicants believe the existing arrangement of the sections presented in the Specification fully satisfy the requirements of 37 C.F.R. §1.77(b).

Claim Objections

Claims 8-11 are objected to for informalities therein. Applicants have amended Claim 8 responsive to the objection and in a manner suggested by the Examiner. As such, Applicants respectfully request withdrawal of the objection.

Claim Rejections – 35 U.S.C. §112

Claims 1-7 are rejected under 35 U.S.C. §112, second paragraph. Applicants respectfully submit the claims have been amended responsive to the rejection. Withdrawal of the rejection is respectfully requested.

Claim Rejections – 35 U.S.C. §102 & §103

Claims 1-5 are rejected under 35 U.S.C. §102(b) as being anticipated by J.P. 11-130876 to Hiroko et al. (Hiroko). Applicants respectfully traverse the rejection.

Claim 1 recites a sliding element for seals including a carbon matrix formed by firing a matrix comprising 25 to 75 weight % carbon aggregate and 20 to 50 weight % thermosetting synthetic resin binder, wherein the sliding element further includes isolatedly scattered spherical pores inside the carbon matrix and having a diameter in a range of from 1 to 100 μm and concaves formed on a carbon sliding face. Applicants respectfully note that the sliding element of the claimed invention includes a carbon matrix wherein spherical pores are scattered inside, and the carbon matrix is formed by firing a matrix of carbon aggregate and thermosetting resin binder.

Hiroko describes a resin complex including raw material mainly comprising a thermostatic agent, fibrous filler, and a curing agent, which is heat cured at 80 to 250°C after molding at a normal temperature. Gas generated by decomposition of the curing agent comes out from the interior of the resin complex, forming a number of pores inside the resin complex. The pores at the surface of the resin complex are buried due to softening of resinous components, therefore, the pores are formed only inside the

resin complex (see paragraph [0035] of Hiroko). Therefore, a polish process is performed to one principal plane of the resin complex until the pores existing in the interior of the resin complex are exposed (see paragraph [0037] of Hiroko).

According to the invention recited by Claim 1, carbon aggregate and a synthetic resin binder are blended with spherical resin. After mixing, kneading, and molding the same, it is fired to 800 to 3000°C, causing volatilization of the spherical resin inside the carbon matrix, consequently forming isolated spherical pores inside the carbon matrix and concaves on the surface of the carbon matrix.

Furthermore, Applicants note the method in which the pores of the invention are manufactured differs from the method of Hiroko. By manufacturing the pores with generating gas, as in Hiroko, it is not possible to result in pores that are isolated or spherical, as recited in the invention recited by Claim 1. In other words, the pores illustrated in Figure 1 of Hiroko are not isolated or spherical.

Moreover, in the invention, to maintain the strength of the sliding material, spherical resin for scattering pores is controlled for its size and amount of its blend (see paragraph [0015] of the instant application). It should be noted that when/if the blend ratio of the spherical resin is higher than the determined range, or when the average particle size and particle size distribution of the spherical resin is higher than the range, the strength of the manufactured sliding material may decrease or neighboring pores may successively connect to each other, thereby causing extraordinary fluid leakage and thus, influence the sealing properties of the sliding element. However, when the blend ratio of the spherical resin is lower than the determined range, or when the

average particle size and particle size distribution of the spherical resin are lower than the range, the blend of the spherical resin may not show the sufficient effect (see paragraph [0016] of the invention).

Hiroko, which does not disclose or suggest the above-discussed spherical resin, cannot possibly maintain the hardness value of the invention.

To qualify as prior art under 35 U.S.C. §102, each and every feature of a rejected claim must be taught or suggested by the applied art of record. As explained above, Applicants respectfully submit Hiroko does not disclose or suggest each and every feature recited by Claim 1. Therefore, Applicants respectfully submit that is not anticipated by or rendered obvious in view of Hiroko and should be deemed allowable.

Claims 2-5 depend from Claim 1. It is respectfully submitted that these dependent claims be deemed allowable at least for the same reasons Claim 1 is allowable as well as for the additional subject matter recited therein.

Applicants respectfully request withdrawal of the rejection.

Claims 1-5 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,990,222 to Watada et al (Watada). Applicants respectfully traverse the rejection.

Claim 1 recites a sliding element for seals including a carbon matrix formed by firing a matrix comprising 25 to 75 weight % carbon aggregate and 20 to 50 weight % thermosetting synthetic resin binder, wherein the sliding element further includes isolatedly scattered spherical pores inside the carbon matrix and having a diameter in a range of from 1 to 100 μm and concaves formed on a carbon sliding face. Applicants

respectfully note that the sliding element of the claimed invention includes a carbon matrix wherein spherical pores are scattered inside, and the carbon matrix is formed by firing a matrix of carbon aggregate and thermosetting resin binder.

Watada discloses a process of producing a resin composite including the steps of mixing thermosetting resin powder with fillers, compression molding the mixed powder at an ordinary temperature, and heating the same at 100 to 250°C (see column 1, lines 11-18 of Watada). The resin generates gas during thermal hardening, thereby forming pores inside the resin composite (see column 6, lines 41-46 of Watada).

The method of manufacturing pores taught by Watada is similar to the method taught by Hiroko described above, and differs from that of the present invention. Accordingly, by manufacturing the pores with generating gas, as in Watada, it is not possible to make the pores isolated or spherical, as recited by Claim 1 of the invention. Consequently, the method of manufacturing pores in Watada does not make it possible to maintain the hardness value of the invention.

Furthermore, small surface defects are not formed on the surface of the molded body of Watada (see column 3, lines 39-42 of Watada). However, as recited by Claim 1, the sliding element for seals is provided with concaves formed on the carbon sliding face. With this feature of the present invention, the hydrodynamic effect, that is, an effect in which concaves on the sliding faces of seals, by rotating, produce dynamic fluid pressure and a lubricant field) can be provided. The resulting benefit provided by the claimed invention is not obtainable by Watada.

To qualify as prior art under 35 U.S.C. §102, each and every feature of a rejected claim must be taught or suggested by the applied art of record. As explained above, Applicants respectfully submit Watada does not disclose or suggest each and every feature recited by Claim 1. Therefore, Applicants respectfully submit that is not anticipated by or rendered obvious in view of Watada and should be deemed allowable.

Claims 2-5 depend from Claim 1. It is respectfully submitted that these dependent claims be deemed allowable at least for the same reasons Claim 1 is allowable as well as for the additional subject matter recited therein.

Applicants respectfully request withdrawal of the rejection.

Claims 6-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over Watada in view of U.S. Patent No. 5,080,378 to Kagawa (Kagawa). Applicants respectfully traverse the rejection.

Claims 6-7 depend from Claim 1, which is discussed above, and include all of the features recited therein.

Watada is discussed above.

The Office Action asserts Kagawa teaches a silicon carbide sintered body for a mechanical seal, and that the seal includes a pair of stationary and rotary sliding rings, wherein at least one of which is made from sintered silicon carbide.

Applicants respectfully note that the silicon carbide sintered body taught by Kagawa has pores. Such a sintered body essentially corresponds to the conventional method described in paragraph [0008] of the instant application. That is, when using a combination of silicon carbide sliding material with scattered pores and carbon material as

a mechanical seal, the silicon carbide scratches the carbon material, which leads to an increase in torque, and further, wears down the carbon sliding element.

However, Applicants note that the pores (concaves) on the silicon carbide sliding face may get clogged by the powder of the carbon, and the pores on the sliding face may not maintain the stable fluid lubrication effect (see paragraph [0008] of the instant application).

Moreover, Applicants respectfully submit that Kagawa does not overcome all of the deficiencies of Watada with regards to Claim 1, from which Claims 6-7 depend. Therefore, Applicants respectfully submit one of ordinary skill would not deem it obvious to modify Watada according to the teachings of Kagawa, and, even if such a modification of Watada were made, the result would not include all of the features of the sealing element recited by Claim 1.

For the above-discussed reasons, Applicants respectfully submit that Claims 6-7 are not obvious in view of the applied teachings of Watada and Kagawa, and should be deemed allowable for at least the same reasons Claim 1 is allowable as well as for the additional subject matter recited therein.

Applicants respectfully request withdrawal of the rejection.

Claims 1-7 are rejected under 35 U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 5,538,649 to Demendi et al. (Demendi). Applicants respectfully traverse the rejection.

Claim 1 recites a sliding element for seals including a carbon matrix formed by firing a matrix comprising 25 to 75 weight % carbon aggregate and 20 to 50 weight %

thermosetting synthetic resin binder, wherein the sliding element further includes isolatedly scattered spherical pores inside the carbon matrix and having a diameter in a range of from 1 to 100 μm and concaves formed on a carbon sliding face. Applicants respectfully note that the sliding element of the claimed invention includes a carbon matrix wherein spherical pores are scattered inside, and the carbon matrix is formed by firing a matrix of carbon aggregate and thermosetting resin binder.

Demendi does not disclose or suggest spherical resin, therefore, as with the case of Hiroko and Watada, it is not possible to produce spherical pores as recited by Claim 1. Further, with the manufacturing method of Demendi, it is not possible to control the size of the spherical resin or the amount of its blend. Accordingly, Demendi cannot possible maintain the hardness value of the invention. Moreover, Applicants note the Office Action asserts that Table 1A of Demendi describes silicone carbide as mating ring wear. However, the claimed invention recites a seal assembly of carbide sliding material with scattered spherical pores and silicone carbide without pores. According to the results of examples of the invention using the seal assembly, scattering pores insides the flexible carbon material having solid or good lubrication properties as opposed to the rigid silicon carbide material can reduce the friction coefficient. Furthermore, the adhesion, seizure or damage of rubber occur at the silicone carbide, which is poor in lubrication properties, can be prevented by the seal assembly (see paragraph [0027] of the invention).

To qualify as prior art under 35 U.S.C. §102, each and every feature of a rejected claim must be taught or suggested by the applied art of record. To establish *prima facie*

obviousness, each feature of a rejected claim must be taught or suggested by the applied art of record. M.P.E.P. §2143.03. As explained above, Applicants respectfully submit Demendi does not disclose or suggest each and every feature recited by Claim 1. Therefore, Applicants respectfully submit that is not anticipated by or rendered obvious in view of Demendi and should be deemed allowable.

Claims 2-7 depend from Claim 1. It is respectfully submitted that these dependent claims be deemed allowable at least for the same reasons Claim 1 is allowable as well as for the additional subject matter recited therein.

Applicants respectfully request withdrawal of both rejections.

Claims 8-11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Demendi in view of Kagawa. Applicants respectfully traverse the rejection.

Claim 8 recites a process of manufacturing sliding element for seals, including the steps of blending source material mainly comprised of 25 to 75 weight % carbon aggregate and 20 to 50 weight % thermosetting synthetic resin binder with 1 to 30 weight % spherical resin, which is a resin having a spherical form and different from the thermosetting resin binder, and after mixing, kneading, and molding the blended material to a preform, firing the preform to a predetermined temperature.

Demendi is discussed above.

Kagawa is discussed above.

To establish *prima facie* obviousness, each feature of a rejected claim must be taught or suggested by the applied art of record. M.P.E.P. §2143.03. As explained above, Applicants respectfully submit Demendi and Kagawa, alone or in any

combination, do not disclose or suggest each and every feature recited by Claim 8. Therefore, Applicants respectfully submit that is not anticipated by or rendered obvious in view of Demendi and Kagawa, and should be deemed allowable.

Claims 9-11 depend from Claim 8. It is respectfully submitted that these dependent claims be deemed allowable at least for the same reasons Claim 8 is allowable as well as for the additional subject matter recited therein.

Applicants respectfully request withdrawal of the rejection.

Conclusion

In view of the foregoing, reconsideration of the application, withdrawal of the outstanding objections and rejections, allowance of Claims 1-11, and the prompt issuance of a Notice of Allowability are respectfully solicited.

Should the Examiner believe anything further is desirable in order to place this application in better condition for allowance, the Examiner is requested to contact the undersigned at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, **referencing docket number 108179-00035.**

Respectfully submitted,
ARENT FOX PLLC

A handwritten signature in black ink, appearing to read 'MO' followed by a stylized flourish.

Murat Ozgu
Attorney for Applicants
Registration No. 44,275

Customer No. 004372

1050 Connecticut Avenue, NW, Suite 400
Washington, DC 20036-5339
Telephone: (202) 857-6000

MO/elp